WHAT IS CLAIMED IS:

1. A positioning system comprising:

an articulated supporting arm comprising a plurality of jointedly interconnected support arm segments moveable about a plurality of axes;

a plurality of compliant members positioned on said supporting arm; and

an articulated measuring arm comprising a plurality of jointedly interconnected measuring arm segments capable of a plurality of degrees of freedom of movement and supported by said compliant members wherein said compliant members provide a yielding characteristic between the articulated supporting arm and the articulated measuring arm.

2. The positioning system of Claim 1, further comprising:

a probe member attached to said articulated measuring arm and positioned in three dimensional space by the articulated measuring arm.

3. The positioning system of Claim 2 wherein, the probe member comprises a coordinate measuring component for acquiring geometry information.

4. The positioning system of Claim 2 wherein, the probe member comprises a tool to be accurately positioned in three dimensional space.

5. The positioning system of Claim 2 wherein, the probe member comprises an instrument to be accurately positioned in three dimensional space.

6. The positioning system of Claim 1 wherein, the articulated supporting arm and articulated measuring arm are aligned such that movement of the articulated supporting arm in a first direction effectuates movement of the articulated measuring arm in the same relative direction.

7. The positioning system of Claim 1 wherein, the articulated supporting arm and articulated measuring arm are generally coaxially aligned.

8. The positioning system of Claim 1 wherein, the support arm segments of the articulated supporting arm are shaped so as to at least partially contain the measuring arm segments of the articulated measuring arm.

9. The positioning system of Claim 8 wherein, the plurality of compliant members position and support the measuring arm segments of the articulated measuring arm within the support arm segments of the articulated supporting arm.

10. The positioning system of Claim 1 wherein, the yielding characteristic of the compliant members permit a degree of angular offset between the articulated supporting arm and articulated measuring arm.

11. The positioning system of Claim 10 wherein, angular offset between the articulated supporting arm and articulated measuring arm is effectuated by stress applied to either the articulated supporting arm or the articulated measuring arm.

12. The positioning system of Claim 1 wherein, mechanical stress along the measuring arm is reduced by the support provided by the compliant members.

13. The positioning system of Claim 1 wherein, the compliant members are formed from an at least partially deformable material.

14. The positioning system of Claim 13 wherein, the deformable material comprises a material selected from the group consisting of: rubber, plastic, nylon, foam, metal, and spring materials.

15. The positioning system of Claim 1 wherein, the yielding characteristic of the compliant member is provided by a gas-filled chamber between the articulated supporting arm and the articulated measuring arm.

16. The positioning system of Claim 1 further comprising:

at least one alignment detector configured to detect the alignment between the articulated supporting arm and the articulated measuring arm.

17. The positioning system of Claim 16 wherein, the alignment detector comprises at least one strain gauge configured to measure deformation in the compliant members indicative of the relative alignment between the articulated supporting arm and the articulated measuring arm.

18. The positioning system of Claim 16 wherein, the alignment detector comprises at least one pressure sensor configured to measure deformation in the compliant members indicative of the relative alignment between the articulated supporting arm and the articulated measuring arm.

19. The positioning system of Claim 16 wherein, the alignment detector comprises at least one encoder configured to measure the angular displacement between the articulated supporting arm and the articulated measuring arm.

20. The positioning system of Claim 16 wherein, the alignment detector comprises a first encoder for detecting angular displacement in a selected support arm segment of the articulated supporting arm and a second encoder for detecting angular displacement of a selected measuring arm segment in the articulated measuring arm.

21. The positioning system of Claim 1 wherein, the articulated supporting arm at least partially isolates the articulated measuring arm from physical perturbations.

22. The positioning system of Claim 1 wherein, the articulated supporting arm at least partially thermally isolates the articulated measuring arm.

23. The positioning system of Claim 1 wherein, the articulated supporting arm defines a space in which the compliant members at least partially reside and provide a constrained range of alignment between the articulated supporting arm and the articulated measuring arm.

24. The positioning system of Claim 1 wherein, the compliant members dampen vibrations transmitted to the articulated measuring arm.

25. The positioning system of Claim 1 further comprising:

at least one actuator that mechanically positions the articulated supporting arm.

26. The positioning system of Claim 25 wherein, the actuator is remotely located with respect to the support arm segment it is configured to position.

27. The positioning system of Claim 26 wherein, a flexible drive cable transmits a positioning force generated by the remotely located actuator to the support arm segment.

28. The positioning system of Claim 26 wherein, a flexible drive cable transmits a positioning torque generated by the remotely located actuator to the support arm segment.

29. The positioning system of Claim 27 wherein, the positioning of the remotely located actuator reduces heat, vibration, and weight along the articulated supporting arm.

30. The positioning system of Claim 27 wherein, the positioning of the remotely located actuator reduces heat, vibration, and weight along the articulated measuring arm.

31. The positioning system of Claim 1 further comprising:

a controller configured to direct the positioning of the articulated supporting arm.

32. The positioning system of Claim 31 wherein, the controller directs positioning of the articulated supporting arm with respect to the articulated measuring arm to reduce the relative degree of angular deflection between the arms.

33. The positioning system of Claim 31 wherein, the controller receives information from a first and second encoder and determines the alignment of the articulated supporting arm with respect to the articulated measuring arm on the basis of the received information.

34. The positioning system of Claim 31 wherein, the controller directs positioning of the articulated supporting arm to provide assisted movement of the articulated measuring when an exerted force is applied to the articulated measuring arm.

35. The positioning system of Claim 31 wherein, the controller directs positioning of the articulated supporting arm to resist movement of the articulated measuring arm when a force is applied to the articulated measuring arm.

36. The positioning system of Claim 31 wherein, the controller directs positioning of the articulated supporting arm to resist movement of the articulated measuring arm when a torque is applied to the articulated measuring arm.

37. The positioning system of Claim 31 wherein, the controller directs characteristics selected from the group consisting of: speed, direction, and distance for positioning of the articulated supporting arm based upon the detected alignment between the articulated supporting arm and the articulated measuring arm.

38. The positioning system of Claim 37 wherein, the characteristics of the articulated supporting arm positioning are generally proportional to a detected change in alignment between the articulated measuring arm member and the articulated supporting arm.

39. An accurate positioning system comprising:

an articulated supporting arm comprising a plurality of jointedly interconnected support arm segments moveable about a plurality of axes;

a plurality of compliant members positioned about said supporting arm;

an articulated measuring arm comprising a plurality of jointedly interconnected measuring arm segments capable of a plurality of degrees of freedom of movement and supported by said compliant members wherein said compliant members provide a yielding characteristic between the articulated supporting arm and the articulated measuring arm.

a controller configured to direct positioning of the articulated supporting arm; and

a datastore containing information that is accessible by the controller and used to resolve the alignment of the articulated supporting arm with respect to the articulated measuring arm.

40. The positioning system of Claim 39 further comprising:

at least one actuator that mechanically positions the articulated supporting arm as directed by the controller.

41. The positioning system of Claim 39 further comprising:

at least one alignment detector configured to generate alignment information characterizing the alignment of the articulated supporting arm and the alignment of the articulated measuring arm and further configured to provide the alignment information to the controller.

42. The positioning system of Claim 41 wherein, the at least one alignment detector comprises an encoder configured to detect the alignment of the articulated positioning arm and the articulated measuring arm.

43. The positioning system of Claim 41 wherein, the at least one alignment detector comprises a first encoder configured to ascertain the position of the articulated positioning arm and a second encoder is configured to ascertain the position of the articulated measuring arm.

44. The positioning system of Claim 42 wherein, the controller receives information from the first and second encoders and determines the alignment of the articulated positioning arm with respect to the articulated measuring arm on the basis of the encoder information evaluated against pre-determined encoder information contained in the datastore.

45. The positioning system of Claim 41 wherein, the controller determines the alignment of the articulated supporting arm with respect to the articulated measuring arm by comparing the alignment information with previously determined alignment information contained in the datastore.

46. The positioning system of Claim 39 wherein, the controller resolves the position of the articulated positioning arm with respect to the articulated measuring arm based upon their respective angular deflections.

47. The positioning system of Claim 46 wherein, the angular deflections are determined in part by the yielding characteristic of the compliant members between the articulated supporting arm and the articulated measuring arm.

48. The positioning system of Claim 39 wherein, at least one strain gauge is configured to detect stress applied to selected compliant members, the detected stress used by the controller to direct positioning of the articulated supporting arm.

49. The positioning system of Claim 39 wherein, at least one pressure sensor is configured to detect stress applied to selected compliant members, the detected stress used by the controller to direct positioning of the articulated supporting arm.

50. The positioning system of Claim 39 wherein, the complaint members are formed from an at least partially deformable material and at least one alignment detector measures force applied to the at least one compliant member based on the degree of deformation of the compliant member.

51. The positioning system of Claim 39 wherein, the complaint members are formed from an at least partially deformable material and at least one alignment detector measures torque applied to the at least one compliant member based on the degree of deformation of the compliant member.

52. The positioning system of Claim 39 wherein, the datastore comprises a plurality of alignment detector values associated with selected angular deflections

of the articulated positioning arm and the articulated measuring arm defining various positionings.

53. The positioning system of Claim 52 wherein, the controller discerns the relative position of the articulated measuring arm by comparing alignment detector values associated with a current positioning of the articulated supporting arm with information contained in the datastore that has been previously associated selected positions of the articulated supporting arm.

54. The positioning system of Claim 39 wherein, the controller selectively positions the articulated measuring arm by determining appropriate angular deflections of the articulated positioning arm based upon the information contained in the datastore.

55. The positioning system of Claim 39 further comprising:

a probe member attached to said articulated measuring arm and positioned in three dimensional space by the articulated measuring arm.

56. The positioning system of Claim 55 wherein, the probe member comprises a tool to be accurately positioned in three dimensional space.

57. The positioning system of Claim 55 wherein, the probe member comprises an instrument to be accurately positioned in three dimensional space.

58. The positioning system of Claim 55 wherein, the probe member comprises a coordinate acquisition device for acquiring geometry information and wherein positioning of the coordinate acquisition device is directed at least in part by the controller that directs positioning the articulated positioning member which in turn effectuates positioning of the articulated measuring arm through the compliant members.

59. The positioning system of Claim 55 wherein, the controller provides instructions to at least one actuator to effectuate desired angular deflections of the articulated positioning arm with respect to the articulated measuring arm to achieve a selected positioning of the probe member in three dimensional space.

60. The positioning system of Claim 39 wherein, the datastore is developed by directing positioning of the articulated positioning arm in a plurality of orientations and associating each position with information characterizing the angular deflections of the articulated positioning arm member and the articulated measuring arm.

61. The positioning system of Claim 39 wherein, development of the datastore is performed using a training program that contains a plurality pre-determined instructions used to direct positioning of the articulated positioning arm.

62. The positioning system of Claim 39 wherein, the datastore is generated by the steps of:

identifying a plurality of controller instructions to direct positioning of the articulated positioning arm in a plurality of orientations;

measuring the resulting position of the articulated measuring arm arising from each controller instruction; and

associating and storing the instructions and the resulting positionings.

63. The positioning system of Claim 62 wherein, once the datastore has been developed its contents are copied to other positioning systems.

64. The positioning system of Claim 63 wherein, copying of the datastore to other coordinate measuring systems provides a means clone the positioning

characteristics of the articulated positioning arm and articulated measuring arm without having to substantially regenerate the datastore.

65. The positioning system of Claim 39 wherein, the controller directs positioning of the articulated supporting arm by issuing instructions to at least one actuator specifying angular deflections for which to drive positioning of the articulated positioning arm.

66. The positioning system of Claim 39 wherein, the datastore comprises angular deflections of the articulated positioning arm and the articulated measuring arm achieved by various positionings in three dimensional space.

67. The positioning system of Claim 39 wherein, the controller directs power-assisted manual positioning of the articulated positioning arm.

68. The positioning system of Claim 67 wherein, the power-assisted manual positioning of the articulated positioning arm is achieved by the controller detecting manually applied loads and directing positioning of the articulated positioning arm in the direction of the applied load.

69. The positioning system of Claim 68 wherein, manually applied loads to the articulated measuring arm result in changes in the yielding characteristics of the compliant members and are detected by the controller.

70. The positioning system of Claim 69 wherein, the controller ascertains the magnitude of the applied load based upon changes in the yielding characteristics of the compliant members.

71. The positioning system of Claim 39 wherein, the controller determines a driving load used to position the articulated positioning arm based at least in part upon the information contained in the datastore.

72. The positioning system of Claim 39 wherein, the controller determines the magnitude of a driving load to position the articulated positioning arm based in part upon a detected magnitude of applied load.

73. A method for positioning an articulated measuring arm, comprising:

supporting said arm at a plurality of locations with compliant members to reduce mechanical stress on said arm.

74. A method for damping external perturbations encountered by an articulated measuring arm, comprising:

supporting said arm at a plurality of locations with compliant members that position at least a portion of the articulated measuring arm within an exoskeletal structure.

75. A method for directing positioning of an articulated positioning arm and an interconnected articulated measuring arm, comprising:

identifying a plurality of instructions used by a controller to direct positioning of the articulated positioning arm in a plurality of orientations;

measuring the resulting position of the articulated measuring arm arising from each controller instruction; and

associating and storing the instructions and the resulting positionings thereafter to be used by the controller to effectuate a selected positioning.

76. A positioning system comprising:

an articulated arm comprising jointedly interconnected arm segments moveable about at least one degree of freedom;

an articulation member configured to position the jointedly interconnected arm segments; and

a remotely located actuator interconnected to the articulation member by a drive member, wherein the actuator generates a motive force transmitted through the drive member to the articulation member directing positioning by the articulation member and effectuating movement of the positioning arm.

77. The positioning system of Claim 76 wherein, the remotely located actuator is placed in such a manner so as to dampen vibrations in the jointedly interconnected arm segments and articulation member resulting from operation of the actuator.

78. The positioning system of Claim 76 wherein, the remotely located actuator is placed in such a manner so as to reduce heat transmission to the jointedly interconnected arm segments and articulation member resulting from operation of the actuator.

79. The positioning system of Claim 76 wherein, the remotely located actuator is placed in such a manner so as to displace its weight away from the jointedly interconnected arm segments and articulation member.

80. The positioning system of Claim 76 wherein, the remotely located actuator is secured to a distal portion of a selected arm segment away from the articulation member located near a proximal portion of the selected arm segment.

81. The positioning system of Claim 76 wherein, the drive member comprises a motive force-transmitting component selected from the group consisting of: a cable, a shaft, a rod, and a tube.

82. The positioning system of Claim 76 wherein, the drive member allows non-linear positioning of the actuator with respect to the articulation member.

83. The positioning system of Claim 82 wherein, the drive member is at least partially flexible to accommodate non-linear positioning of the actuator with respect to the articulation member.

84. The positioning system of Claim 76 wherein, the actuator is linearly positioned with respect to the articulation member.

85. The positioning system of Claim 76 wherein, the at least one degree of freedom comprises an angular degree of freedom.

86. The positioning system of Claim 76 wherein, the at least one degree of freedom comprises a rotatable degree of freedom.